General Notes.

GEOLOGY AND PALEONTOLOGY.

The Geology of the Antartic Continent.—So little is known of the Antarctic polar regions that the résumé of facts given by Dr. John Murray, in a recent address before the Royal Geographical Society is of especial interest. Dr. Murray believes that there is abundant evidence of true continental land within the Antarctic circle, equal if not surpassing in extent the continent of Australia. Ross reports gray granite in the neighborhood of Victoria Land, and Dr. Donald secured some Tertiary fossils from the Seymour Island. D'Urville found both granite and gneiss exposed on an island near Adélie Land, while Wilkes describes an iceberg in the same locality covered with clay, mud, gravel, stones and large boulders of red sandstone and basalt, 5 or 6 feet in diameter. During the Challenger expedition fragments of granite and quartz were dredged from the bottom of the sea at the fortieth parallel of south latitude and as the vessel proceeded toward the Antarctic circle these fragments of rocks increased in number until they together with mineral particles and mud derived from land made up the larger part of the deposit. These fragment consist of granites, quartziferous diorites, schistoid diorites, amphibolites, mica schists, grained quartzites, sandstones, a few fragments of compact limestone, and partially decomposed earthy shales. They are distinctly indicative of continental land, and were undoubtedly transported by icebergs from the South Polar regions.

Among the numerous maps used by Dr. Murray to illustrate his paper is one showing the oceanic deposits around the Antarctic continent. Near the Antarctic land are the terrigenous deposits made of detritus from the continent. Glauconite is found in the blue mud of this area. A little to the north, the bottom is covered with a pure white siliceous deposit, the Diatom Ooze. Still further to the north, where the Diatoms on the surface have been replaced by Foraminifera and Pteropods, the deposit is a pinkish-white Globigerina Ooze. In latitude about 40° S. the sea is about 3 miles in depth, and here the deposit is composed of a fine Red Clay, manganese nodules, zeolitic crystals, spherules of extra-terrestrial origin, thousands of sharks teeth, and the remains of Cetaceans. In this red clay area a trawl brought up in a single hand over 1500 sharks teeth, some of them not to be distinguished from the

specimens of Carcharodon, found in the Red Crag of England. (Geog. Journ., Jan., 1894.)

Intrusive Sandstone Dikes in Granite.—During the summer of 1893, a peculiar sandstone rock composed of worn quartz grains was discovered in the neighborhood of Pikes Peak in the western side of the narrow Manitou park basin of sedimentary rocks. This rock occurs as the filling of an extensive system of fissures in granite under circumstances indicating that the sand was forced into the fissures under great pressure. Mr. Whitman Cross discusses the origin of these Dikes without, however, coming to any definite conclusion. So far as he is aware no other occurrence of sandstone dikes in granite has ever been described. They may be compared with the remarkable occurrences in California described by Diller.[1] These latter, however, were in shales of a great sedimentary complex of Cretaceous age, and they were parallel to a system of jointing planes in the strata. Moreover, Diller noted that below the horizons occupied by the dikes there occurred sandstone strata of a composition identical with that of the dike-rocks. The very plausible theory presented by Diller was that the fissures represented by the dikes were formed by earthquake shock, and that the sand was injected as quick-sand into the fissures under hydrostatic pressure from unconsolidated water-bearing sand layers below.

The Colorado dikes are more difficult to explain than those of California in that the known facts do not indicate the source of the sand; yet the physical and mechanical facts do seem to show that the fissures of this dike complex were filled by a fine quick-sand injected from a source containing a large amount of homogeneous material. On the one hand, it is impossible to suppose that such a system of fissures, large and small, with their many intersections, could remain open to be filled by any slow process, and, on the other hand, it is equally impospossible to believe that the uniformity and purity of the material filling the fissures, varying from mere films on cleavage planes of orthoclase grains in the granite to dikes several hundred yards in width, could have resulted from infiltration.

It has been stated above that the belt of observed dikes lies adjacent and parallel to the Manitou park basin of sedimentary rocks, the principal element in which is the red sandstones and grits of the Carboniferus (?) or Trias (?). These beds are, however, of much coarser and more heterogeneous character than the dike-rock, and the observations made do not suggest that the proximity is anything more than accident-

[1] Sandstone Dikes, J. S. Diller: Bull. Geol. Soc. Am., Vol. I, 1889.

al. It is not known that the dikes are younger than the sedimentary, for they were nowhere found in contact. The strata of the basin are now seen at the same level with the dikes, but faulting and a synclinal fold have clearly lowered them with reference to the granite on either side. Finally, it is probable that the dikes are not limited to the vicinity of the sedimentary basin. Neither end of the belt containing the dikes was determined, and an observation by Professor G. H. Stone shows plainly that sandstone dikes do occur in the same general strike line far removed from any sedimentary rocks. (Bull. Geol. Soc. Am. Vol. 5, 1894.)

The Origin of the Vichy Mineral Waters.—M. Dollfus has been making a study of the geology of the environs of Vichy and comes to the following conclusions as to the origin of the celebrated medicinal water of that region.

The waters charged with soda derived from the decomposition of porphyry percolate the earth in contact with carboniferous conglomerates and the Culm strata flowing in a synclinal. When their downward course is checked by the granules or the micropegmatites which are impermeable, they reascend through the tertiary beds. Here their flow is partially impeded by the arkose beds which are topped by the Cusset Marls, and an immense water sheet is formed near the contact of these two formations. Atmospheric waters are here the important factors, and the carbonic acid gas with which they are charged becomes an active agent, displacing even the silicic acid of some of the feldspathic compounds. In short the alteration is set up at the surface; decomposition and kaolinization of the porphyrites goes on, under our eyes, at the surface, for, below we see compact, unaltered rocks, in which no chemical activity is apparent.

The origin of the carbonic acid is more difficult to explain. Since the atmospheric waters do not furnish a large enough supply, some of it, as well as the lime, must be derived from chalks of Vernet and the water-bearing marls of Cusset. The phorphyritic strata are limited around the Central Plateau; the presence of granite, covering of impervious clay, an abundance of lime, and all the peculiar series of conditions which are met with at Vichy and no where else, explain the formation of these peculiar mineral waters and their isolation in the midst of hydraulic basins of which the products are so very different. (Rev. Sci. Mars, 1894.)

Metamerism in the Skull of Primordial Palæozoic Fishes.—One of the most interesting of recent discoveries is that by Dr. J. V. Rohon[1] regarding the fossils fishes of the genera *Thyestes* and *Trematas-pis* from the upper Silurian strata of the island of Oesel. Both genera belong to the order Aspidocephali. In *Thyestes* the cartilaginous primordial cranium falls into two distinct regions, anterior and posterior, the former of which is bilaterally segmented, the latter not. On each side of the anterior region five segments are recognizable, the proximal being joined to the middle skull mass, the distal portions being discrete, more or less pointed and arched behind. In the region of the second and third segments is the median frontal organ, between the third and fourth is the well marked optic capsule, while the parietal organ is above the fifth segment and between it and the hinder region of the skull. The hinder portion, representing the occipital region, is in form much like the body portion of the skeleton. Ventrally to it are apparently the remains of gill arches. Labyrinth and jaw apparatus are not differentiated.

From these facts Rohon concludes that the Aspidocephali cannot belong to Cyclostomes, Selachians, Ganoids or Leptocardii. They must belong to a distinct subclass for which he proposes the name Protocephali. The paper is a preliminary one and the complete article with plates will be awaited with interest.—K.

Mr. Rohon does not explain what he understands by the term Aspidocephali. The genera Thyestes and Trematapis have been hitherto included in the family Cephalaspidæ of the order Osteostraca of the subclass Ostracophori of the class Agnatha. M. Rohon's observations show that this systematic arrangement needs no modification, except that the genera Thyestes and Trematapis must be separated as a family distinct from the Cephalaspidæ.—C.

The Auriferous Slates of the Sierra Nevada.—In a recently published paper, Mr. J. P. Smith reviews the opinions of previous writers as to the age of the auriferous slates of the Sierra Nevada, and after giving a brief statement of recent discoveries and determinations of fossils from the beds in question, embodies the results of his investigations in the following conclusions:

"The Auriferous slates are known to consist of Silurian, Carboniferous, Triassic and Jurassic strata."

"The Mariposa slates are of Upper Jurassic, probably lower Kimmeridge age."

[1] Zool Anzsiger XVII, p. 51, 1894.

"The uplift and metamorphism of the Sierra Nevada and of the Coast range occurred in late Jurassic time, before the deposition of the Cretaceous."

"Neumayer's theory of climatic zones cannot be applied with exactness to the Jura of California, which can be understood only by the study of the geographic provinces of that time." (Bull. Geol. Soc. Am. Vol. 5, 1894.)

Comparison of Jurassic and Upper Cretaceous Tritubercolates.—In a paper on upper Cretaceous Mammals, Prof. Osborn makes the following comparison of the Laramie mammalian dentition with that of the earlier Purbeck, and of the later Puerco.

"In the Laramie the modern placental or marsupial dental formulæ are established—the teeth behind the canine are usually seven, and do not usually exceed eight. Marsh observes in one jaw what he considers five premolar alveoli. Second, out of the high crowned upper molars of the Jurassic, such as those of *Amblotherium* and *Spalacotherium*, a relatively low-crowned or bunodont tritubercular molar has been evolved; as this is a possible parent form of the ungulate and primate upper molars, it is an essentially Tertiary type. Third, the lower molars have evolved a broad talonid or heel, which in many cases presents three cusps, whereas in Jurassic types the talonid is a spur or a narrow simple basin. Fourth, the trigonid, which is always very elevated in the Jurassic types, sinks in some cases to the level of the Talonid—another modernization looking toward ungulate and primate ancestry."

"Two features make the Laramie fauna appear more ancient than the Puerco: first, the non-development of an internal cingulum, which is common in the Puerco; second, the entire absence of the hypocone, which is quite strong in some Puerco mammals. On the other hand, the upper and lower molars of Types represented in figs. F, G, I, Cl, respectively, are analogous to Ectoconus, Dissacus, Diacodon, aud Haploconus of the Puerco."

"The zoological affinities of this fauna are at present hard to determine. *Ptilodus* and *Meniscoëssus* are still provisionally referred with the Multituberculates to the Monotremes. *Thlæodon* exhibits a jaw without an angle, and with a surprising resemblance to that of *Polymastodon;* the jaw is certainly neither of the typical placental nor of the marsupial type; this animal may therefore be provisionally considered a trituberculate Monotreme."

"The placentals and marsupials, and the question whether one or both of these orders is represented in this fauna, is still unsettled. Not a single jaw has been found or reported sufficiently complete in the delicate region of the angle to determine positively its placental or marsupial structure. Portions of the jaws which are preserved indicate the presence of the marsupial type of inflection, while others point to distinct placental angulation." (Bull. Am. Mus. Nat. Hist., Vol. 5, 1893.)

Ancestors of the Tapir.—In describing two new species of Protapirus, *P. obliquidens* and *P. simplex,* from the Lower Miocene of Dakota, Messrs. Wortman and Earle take occasion to discuss the phylogeny of the Tapiridæ and thus summarize the points brought out by the descriptions:

"1. We consider the genus Systemodon as standing in ancestral relation to the Tapiridæ.

"2. *Isectolophus latidens* is probably the line leading to the true Tapirs.

"3. If further discovery shows that *I. annectens* has both the last two premolars as complex as the true molars, it must be removed from the main tapir line.

"The earliest member of the subfamily Tapirinæ, or true Tapirs, is found in the Phosphorites of France, there being a considerable interval between the latter formation and the Oreodon Beds of the White River Miocene.

"5. In contrast with the other Perissodactyla of the White River formation, the premolars of *Protapirus* have not assumed the complexity of the true molars.

"6. The foot structure of Protapirus is nearly as far advanced in its evolution as that of the existing American tapir." (Bull. Am. Mus. Nat. Hist., Aug., 1893.)

Geological News,—ARCHEAN—According to Prof. G. H. Williams, volcanic rocks are widely distributed through the crystalline belt of eastern North America. The writer limits the term *volcanic* to effusive or surface igneous rocks, in contrast to such as have solidified beneath the surface. The areas of these ancient volcanic rocks now known fall roughly in two parallel belts; the eastern embraces exposures in Newfoundland, Cape Breton, Nova Scotia, Bay of Fundy, Coast of Maine, Boston Basin and the central Carolinas; the western belt crosses the Eastern Townships and follows the Blue Ridge through Southern Penn-

sylvania, Maryland, Virginia, North Carolina to Georgia. (Journ. Geol., Vol. II, 1894.)

PALEOZOIC—A remarkably well preserved Lepidodendron from E'snost near Autun is described by M. B. Renault under the name *Lepidodendron esnostense.* The specimen shows the stem, leaves, fructification and roots. Attached to the rootlets are small ovoid bodies supposed by the author to be the eggs of an aquatic insect, to which he gives the name *Arthroon rochei.* These same bodies have been observed upon *L. rhodumnense,* found near Combres (Loire), and described by M. Renault some fifteen years ago. (Rev. Sci., Feb., 1894.)

Mr. J. M. Clarke reports the discovery of a perfect specimen of the extreme apex of an Orthoceras, showing the nature of the protoconch. The fossil was found in the Styliola limestone of the Genesee shales, on Canandaigua Lake, New York, in an association of species which represents the earliest appearance in North America of the fauna of *Goniatites intumescens* Beyrich. The specimen consists of the apical chamber, to which the protoconch is attached. The upper end of the specimen shows the first septum to be circular and with a central sipho. The lateral walls of the first chamber taper rapidly to the plane of conjunction with the protoconch, and its depth is about one half that of the latter. The protoconch itself is semi-ovoid in shape, and when pared with those of Orthoceras previously described or figured [in the shrunken condition] is of very large size. It shows no indication of shrinking and its distal extremity is perfectly smooth. The length of the entire specimen is .85 mm.; that of the protoconch, .60 mm.; and the diameter of the first septum 1 mm. (Am. Geol., Vol. XII, 1893.)

MESOZOIC.—From a study of the fossil mammalia of the Stonesfield slate, Mr. E. S. Goodrich concludes that the primitive mammalian molar was probable tritubercular, and that the triconodont type was derived from it by degeneracy, contrary to the views of Cope and Osborn who assume that the primitive mammalian molar was represented by a simple reptilian cone which subsequently acquired a cusp in front and behind giving the Triconodont type, from which the Tritubercular type was derived. (Quart. Journ. Micros. Sci., Vol. 35.)

Mr. R. Lydekker figures and describes a new carnivorous Dinosaur from the Oxford Clay of Peterborough. The specimen comprises the anterior and posterior extremities of the left ramus of the mandible, and represents one of the Thecodontosauridæ. Since it differs from the described genera by the marked deflection of the mandibular symphy-

sis, it is referred to a new genus, Sarcolestes, with the specific name leedsii. (Quart. Journ. Geol. Soc., 1893.)

CENOZOIC.—The British Museum has lately received an extinct skate from the Lower Tertiary Limestome near Cairo, Egypt. It is described by Mr. A. S. Woodward under the name *Mylobatis pentonii.* The specimen consists of the jaws, showing the dentition, which, according to the writer is the largest specimen of Mylisbotis dentition that has hitherto reached any museum. The maximum width of the disk of this extinct species is estimated at not less than five meters. (Proceeds. Zool. Soc. London, 1893.)